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TRAINEE SOURCE AS A PREDICTOR OF UNDERWATER
DEMOLITION TEAM SCHOOL PERFORMANCE

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TRAINEE SOURCE AS A PREDICTOR OF UNDERWATER DEMOLITION
TEAM SCHOOL PERFORMANCE

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BRIEF

Analysis of failure rates of eleven classes of UDT trainees revealed significant differences in graduation potential between men coming to the school from different sources. Enlisted men coming from U. S. Shore or Air Billets and officers coming from OCS appeared to be more likely to graduate than those entering UDT school from other sources. Trainees within certain age ranges were also found to be better prospects than others in terms of likelihood of graduation from UDT school.

Other variables investigated, such as class size or percentage of officers per class, were not found to be related to graduation rate.

A later report will present findings based on an analysis of psychological test scores as predictors of UDT graduation.

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TRAINEE SOURCE AS A PREDICTOR OF UNDERWATER DEMOLITION TEAM SCHOOL PERFORMANCE

A. BACKGROUND AND PURPOSE

As a result of research on Underwater Demolition Team (UDT) trainees in 1954 and 1955, certain selection requirements (age, General Classification Test scores, and swimming ability) were instituted in an attempt to reduce the high percentage of UDT school failures (Hertzka & Anderson, 1956; Alf & Gordon, 1957). These selection requirements were later examined to determine their relationship to fleet performance, subsequent to school graduation (Alf & Gordon, 1957). A later study reported 1) an insufficient number of men volunteered from the fleet to allow strict adherence to the selection requirements, and 2) a favorable graduation rate for a group of volunteers from a previously untapped source, "boot camp," (Alf, 1962).

The UDT school output still is not sufficient to meet staffing requirements of UDT operating units, and the attrition rate in the school remains relatively high. Among the various means available for increasing the number of UDT trained personnel are:

- 1) increase UDT training, staffing, and input,
- 2) reduce the minimum quality required of UDT school graduates,
- 3) improve UDT training so that the completion rate is increased while present minimum quality is maintained,
- 4) recruit and select men for UDT training who possess more potential for UDT school success.

All of the above approaches to the problem are worthy of investigation. As part of a general study focused on improving selection for UDT school, this report is primarily concerned with the differences in quality of men from various input sources. Since UDT school administrative personnel have expressed interest in the relationship between graduation rate and certain variables such as class size, class composition, and trainee age, these data were also collected and analyzed at this time. As a related part of this study various psychological tests have been administered to UDT trainees. A future report will present an analysis of these tests to determine if they would enhance the prediction of UDT school performance.

B. PROCEDURES

1. Samples

Officers and enlisted men from eleven Underwater Demolition Team training Classes, #28 through and including #38, comprise the samples

analyzed in this study. These classes convened from April, 1962 to April, 1966. Limited information from other UDT classes was available for analysis of certain relationships. While some variation in course length has occurred in the past, the standard UDT curriculum currently covers 18 weeks of training.

2. Variables

a. Predictor variables:

(1) Navy Recruitment Source. Student input source was the primary predictor variable investigated in this study.

(a). To compare school performance of students from different input sources all enlisted men in the sample were categorized as follows with reference to their source immediately prior to UDT school assignment.

- Boot Camp
- Aviation (United States and overseas based)
- Fleet (United States based)
- Shore (United States based)
- Fleet (Overseas based)
- Shore (Overseas based)

(b). All officer UDT trainees in the sample were categorized as follows with reference to their source:

- Aviation (United States and overseas based)
- Officer Candidate School (OCS)
- Fleet (United States based)
- Shore (United States based)
- Shore (Overseas based)

(2) Age of applicant. This variable was categorized in two year intervals commencing with age 17.

(3) UDT class characteristics. Although not selection variables, information on ratio of officer to enlisted men in each class, class size, and class time-order were examined as matters of special interest.

b. Criterion measure: UDT school graduation was used as the criterion in this study. Each student was categorized as a UDT graduate, a voluntary or involuntary drop from the program, or as a drop for medical reasons.

3. Analysis of Data

Analysis of data consisted of examining, within each predictor or class characteristic category, the percentage of students graduating

after first removing from the sample all those who were dropped for medical reasons. Projections were then made of the potential benefit that could be expected if the valid predictor and class characteristic variables were employed in future UDT training programs.

C. RESULTS AND DISCUSSION

1. Source Data

a. Do UDT trainees from various Navy sources exhibit differential graduation rates at UDT school?

(1) Yes. Officers coming directly from Officer Candidate School (OCS) had a higher graduation rate in UDT school than those coming from Air, Fleet, or Shore billets. However, the differences between sources were not statistically significant. Enlisted men coming from U. S. Shore billets, Air billets, or directly from Boot Camp had a significantly higher graduation rate than those from U. S. Fleet or Overseas Shore billets.

(2) Discussion: See Figure 1. It may be seen that the pass rate for officers from the most favorable source, OCS, is 20 percentage points greater than the 47 per cent average graduation rate from the three remaining sources, Air, Fleet, and Shore billets. An analysis of variance revealed that this difference between sources could have easily occurred by chance ($F = 1.87$; d.f. 3,147).

For the enlisted men, those entering UDT training from Boot Camp or Air and U.S. Shore billets had an average graduation rate of 43 percent. This was 13 percentage points higher than the average graduation rate obtained by students from U. S. Fleet and Overseas Shore billets. An analysis of variance indicated that the difference between sources was significant beyond the .05 level ($F = 3.60$; d.f. 4,703). It should be noted that the student input from Overseas Fleet billets was too small to include in this comparison. Source of UDT school trainees in combination with additional valid predictors is discussed in section C 3 of this report.

2. Additional Data

a. Is there a predictive relationship between age and graduation rate in UDT training?

(1) Yes. The small number of officers in each age group makes it impossible to draw firm conclusions, but for the present officer sample the group containing 25 and 26 year olds has the lowest percentage graduation.

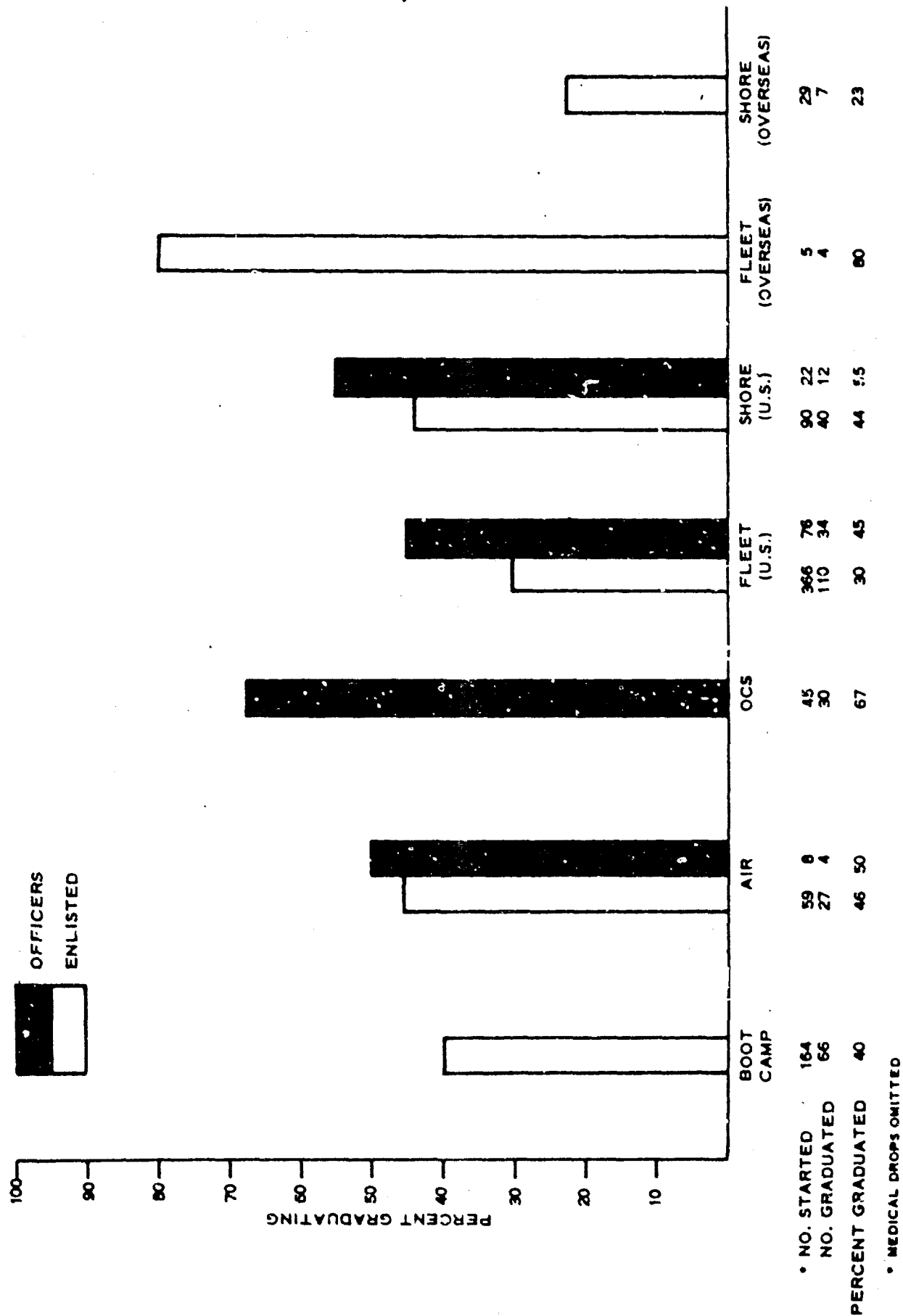


Fig. 1. Percentage of UDT graduates by input source for Classes (28-38).

For the enlisted men, those between the ages of 19 and 24 (inclusive) together with the group who are 29 or older have a higher graduation rate than other age groups.¹ This is consistent with data based on a group from a previous study (Hertzka, 1956), hereafter referred to as the "Hertzka sample."

(2) Discussion: See Table 1 and Figure 2. For enlisted men, two samples were available to evaluate age as a predictor of school success. The data from the Hertzka sample (Hertzka & Anderson, Tables 6 and 7) was used to determine the more and less successful age groups, while the present sample was used to test the stability of these divisions. On the basis of his data, Hertzka recommended that UDT school candidates be at least 19 years old. In the present sample, the pass rate for those below 19 was 27 percent as compared with 37 percent for those 19 and above. This difference was significant at the .05 level ($z = 1.85$). Further examination of the Hertzka data revealed that in addition to the 17 and 18 year olds, the 25-28 year old trainees had an unsatisfactory graduation rate. To test this observation in the present sample the combined pass rate (27 percent) for the ages 17-18 and 25-28 was compared with the combined rate (39 percent) for the 19-24 and 29 or older groups. The 12 percent difference favoring the latter groups is statistically significant at the .05 level ($z = 2.67$). The present study shows a very satisfactory performance for enlisted students aged 31 or over (5 graduates out of 10 entering training). This supports the earlier recommendation against establishing a maximum age for selecting UDT students (Hertzka & Anderson, 1956).

The previous recommendation of establishing a minimum age of 19 is also supported by this study. In addition, the curve representing the total enlisted sample in Figure 2 indicates that rejection of those volunteers between 25 and 28 years of age should be considered if ample enlisted applicants for UDT training are available from the favorable age groups.

b. Is the percentage of officers in the starting class related to the graduation rate of officers or enlisted men?

(1) No.

(2) Discussion: See Table 2 and Figure 3. No trend is evident. Comparing Figure 3 with Figure 1 to detect interaction effects

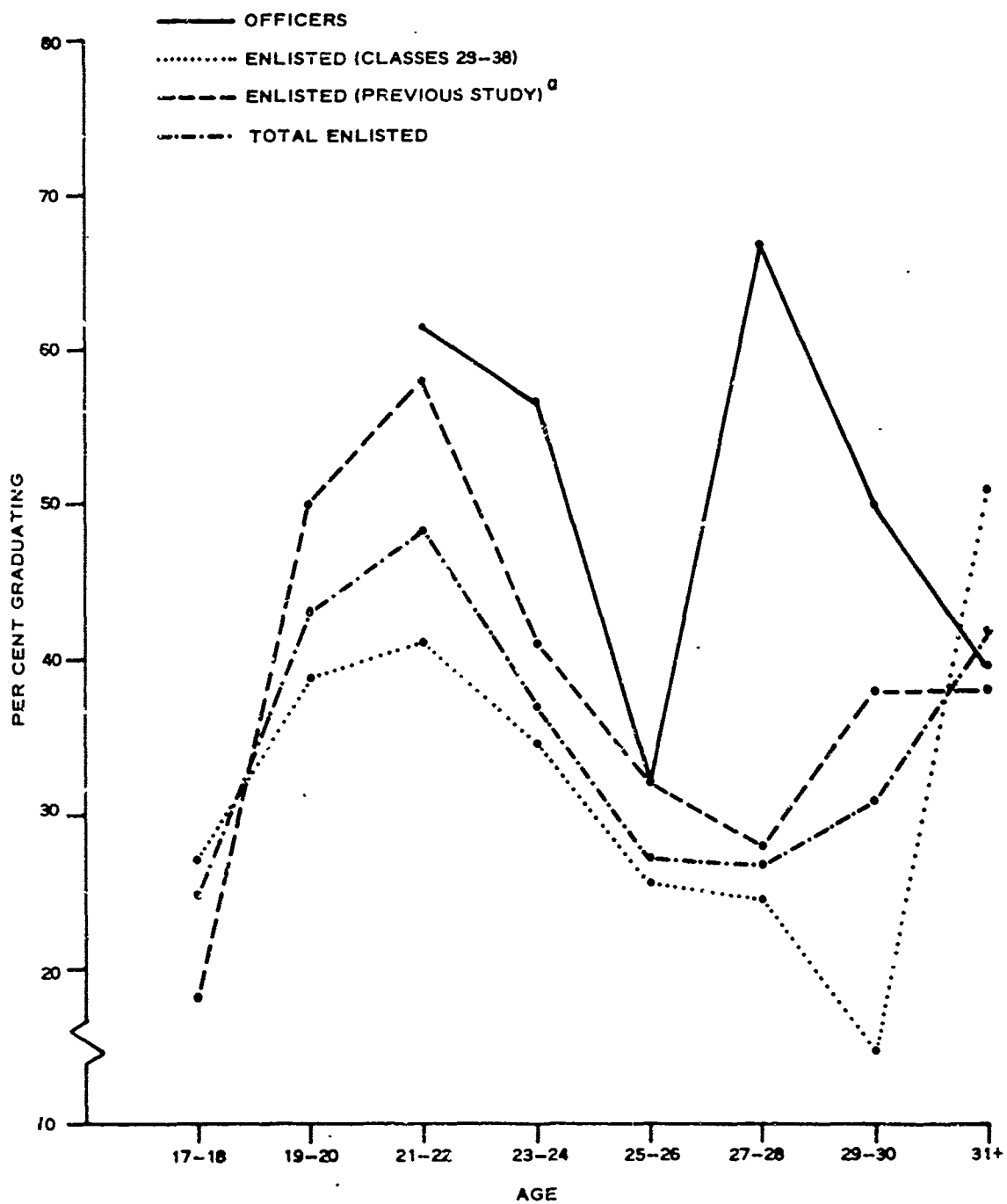
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The 29 and 30 year old sample were included in the more successful age group for the statistical test in order to legitimately test age divisions based on previous research (Hertzka & Anderson, 1956).

TABLE 1

Number and Percentage of Officers and Enlisted Men Successfully
Completing UDT Training for Various Age Groups

Age	Officers			Enlisted Men									
				Present Sample			Hertzka Sample				Combined		
	No. Start.	No. Grad.	% Grad.	No. Start.	No. Grad.	% Grad.	No. Start.	No. Grad.	% Grad.	No. Start.	No. Grad.	% Grad.	% Grad.
17-18	-	-	-	92	25	27	22	4	18	114	29	25	
19-20	-	-	-	282	110	39	114	57	50	386	167	43	
21-22	29	18	62	143	58	41	108	63	58	251	121	48	
23-24	79	45	57	66	23	35	41	17	41	107	40	37	
25-26	22	7	32	35	9	26	25	8	32	60	17	28	
27-28	6	4	67	20	5	25	25	7	28	45	12	27	
29-30	2	1	50	13	2	15	26	10	38	39	12	31	
31+	5	2	40	10	5	50	21	8	38	31	13	42	



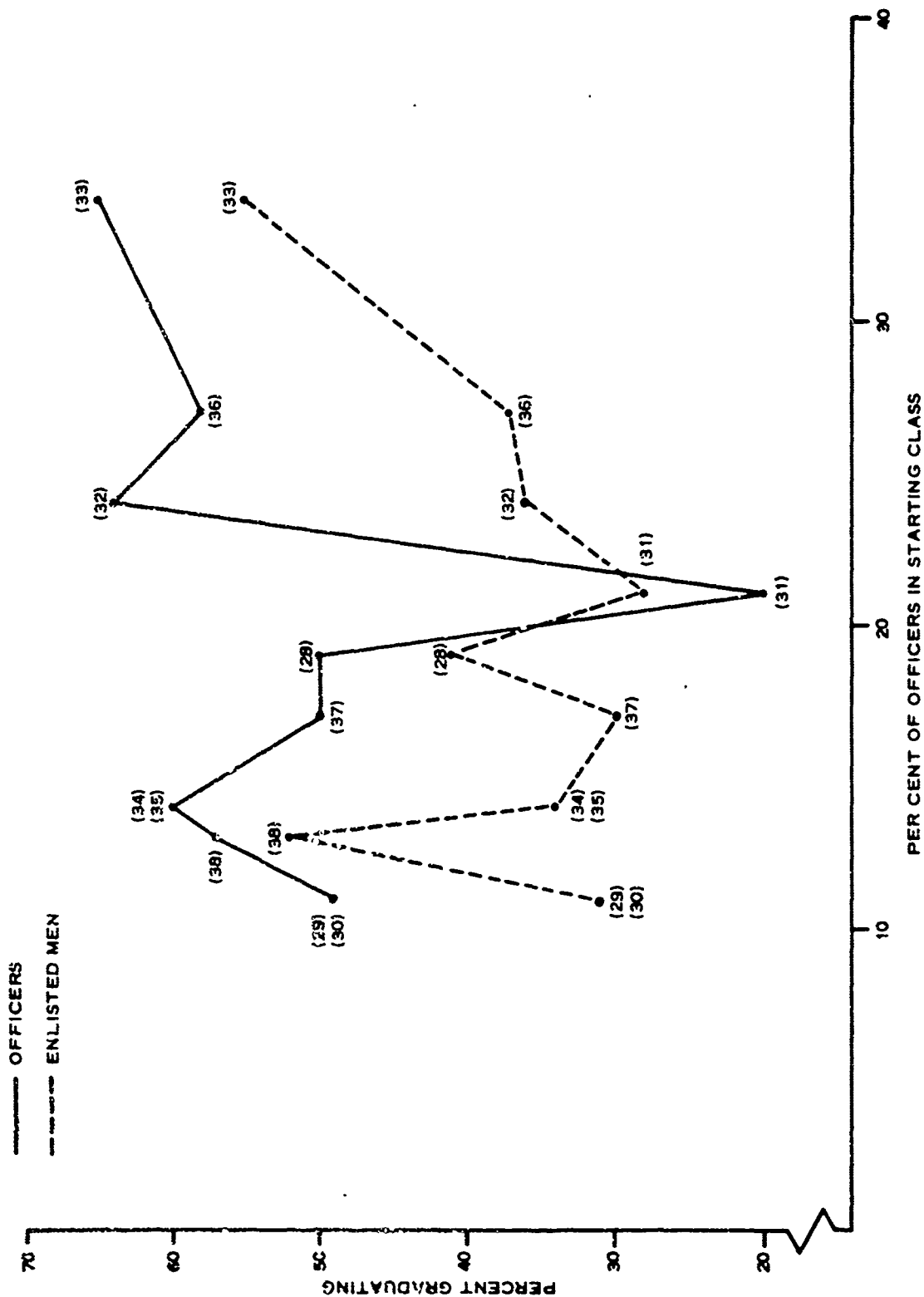
NOTE:

^a DATA OBTAINED FROM TABLES 7 & 8 OF HERZKA & ANDERSON (1956)

Fig. 2. Percentage of UDT graduates by age group.

TABLE 2
Number and Percentage of UDT Officers and Enlisted Men for Various
Disposition Categories by Class

Class Number	Sample						Officer Disposition						Enlisted Disposition							
	Total			Officers			Enlisted			Grad.	Vol.		Drop	Invol.	Grad.	Vol.		Drop	Invol.	
	N	N	%	N	N	%	N	N	%		N	%				N	%			N
28	96	18	19	78	81		9	50	3	17	6	33	32	41	27	35	19	24		
29	124	13	11	111	90		7	54	3	23	3	23	34	31	50	45	27	24		
30	95	10	11	85	90		4	40	3	30	3	30	26	31	32	38	27	32		
31	72	15	21	57	79		3	20	4	27	8	53	16	28	2	04	39	68		
32	58	14	24	44	76		9	64	2	14	3	21	16	36	17	39	11	25		
33	58	20	34	38	66		13	65	3	15	4	20	21	55	5	13	12	32		
34	88	12	14	76	86		6	50	4	33	2	17	23	30	39	51	14	18		
35	88	12	14	76	86		8	67	2	17	2	17	28	37	38	50	10	13		
36	71	19	27	52	73		11	58	1	5	7	37	19	37	12	23	21	40		
37	69	12	17	57	83		6	50	4	33	2	17	17	30	24	42	16	28		
38	54	7	13	47	87		4	57	-	-	3	43	24	51	8	17	15	32		



NOTE: PARENTHESES CONTAIN CLASS NUMBER

Fig. 3. Relationship between percentage of officers starting UDT classes and percentage of officers and enlisted men graduating.

of class size and percentage of officers also did not reveal any evident trends.

c. Is UDT class size related to the percentage of graduates?

(1) No.

(2) Discussion: See Table 2 and Figure 4. Inspection of Figure 4 suggests the possibility of a trend toward slightly higher graduation rates for both officers and enlisted men in the smaller classes. If there is such a relationship, the breaking point for class size appears to be around 60.

As a further check that small classes (60 or less) may graduate a larger proportion of students, data from UDT Classes #18 through #27 were obtained. Of these classes all but Class #26 contained 60 or less students. The classes containing 60 or fewer students, hereafter referred to as the independent small class sample, are presented below in Table 3 with their corresponding graduation rates.

TABLE 3

Number and Percentage of UDT Officer and Enlisted Graduates from
The Independent Sample of Small Classes

Class Number	Number Starting		Graduates			
	Officers	Enlisted	Officers		Enlisted	
			N	%	N	%
18	14	35	12	86	13	37
19	15	36	8	53	23	64
20	11	30	3	27	12	40
21	10	22	3	30	12	55
22	11	35	5	45	15	43
23	8	29	2	25	7	24
24	5	28	2	40	7	25
25	7	32	4	57	6	19
27	3	57	3	100	13	23

The officers in the independent small class sample had an overall graduation rate of 50.0 percent which is 13.4 percentage points lower than the officers in the present sample's small class.

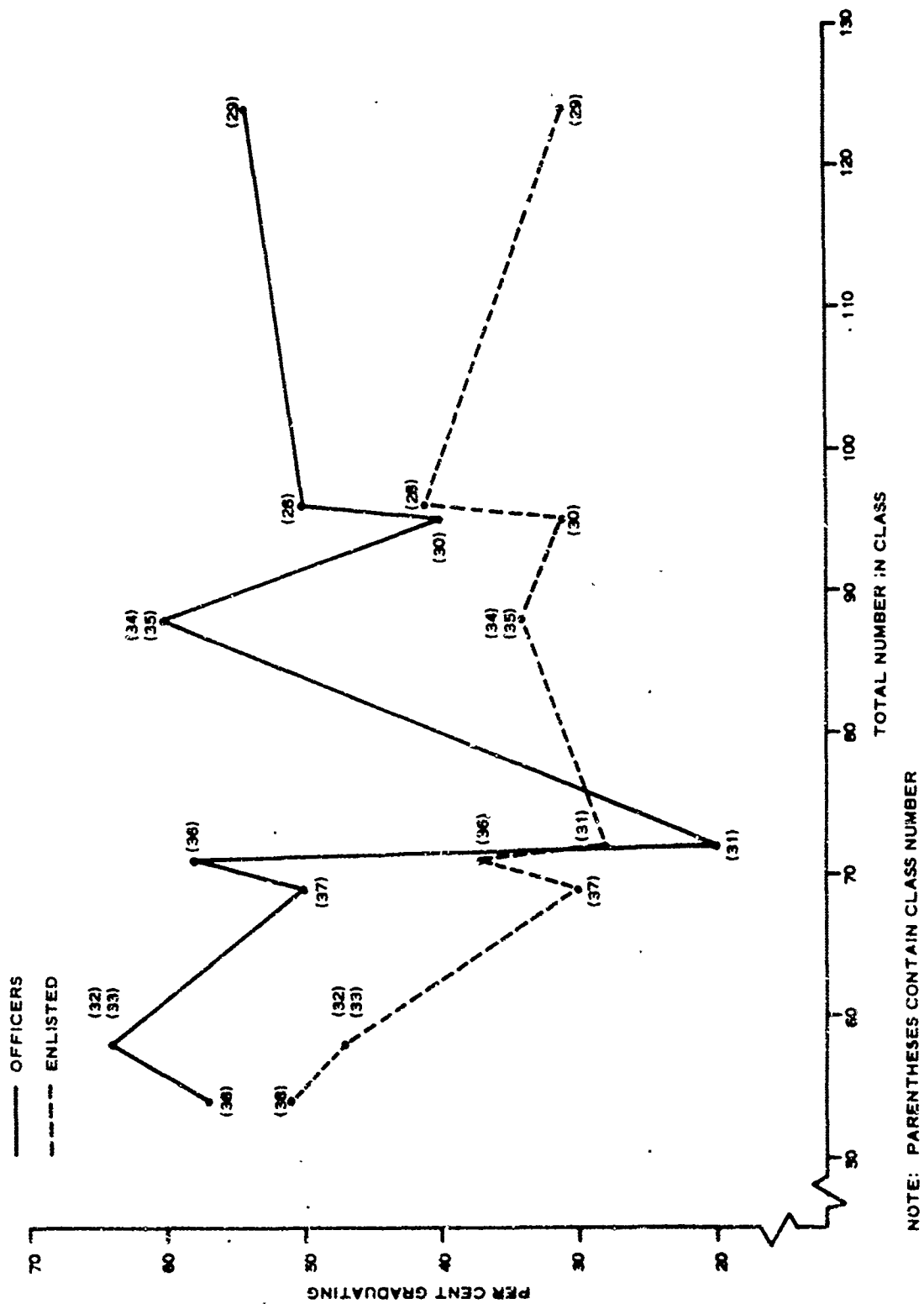


Fig. 4 Percentage of UDT graduates by class size.

Similarly, the enlisted graduation rate of 35.5 percent for the independent small class sample is 11.8 percentage points lower than the graduation rate for the enlisted men in the present sample's small classes.

While these data indicate a loss of the apparent advantage for small classes a further comparison was made between the graduation rates of the independent small class sample and the present sample's large classes.² For the officers in these groups a test of statistical significance was made between the 50.0 percent graduation rate for the small class sample and the 48.6 percent graduation rate for the large class sample. The obtained z of 0.19 failed to reach the .05 significance level. Similarly, a z of 0.46 was obtained for the enlisted men, when the difference between graduation rate of 35.5 percent for the small class sample and a graduation rate of 32.9 percent for the large class sample was tested for significance. These results indicate, for both officers and enlisted men, that smaller class size per se, does not lead to significantly higher graduation rates.

d. Is there any time trend evident in percentage of graduates?

(1) No.

(2) Discussion: See Table 2 and Figure 5. The rather large differences in percent graduating from class to class would make an over-all trend difficult to detect; however there appears to be no recognizable over-all trend.

3. Combination of Valid Predictors.

a. Can improved prediction be expected if age and Navy source are used in combination to select future UDT trainees?

(1) Yes. See Tables 4,5, and Figure 6. For the enlisted men these data suggest that combining age and source results in prediction better than that possible with either used alone. When the

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The ideal comparison would be between an independent sample of large versus small class graduation rates. However, since sufficient large class data were not available from Classes '18-27, it was necessary to compare the graduation rates of the independent sample of small classes with present sample's large classes. While comparing these graduation rates does not provide a test on data completely independent from where the hypothesized relationship was observed, it should be less biased than use of only the more recent data.

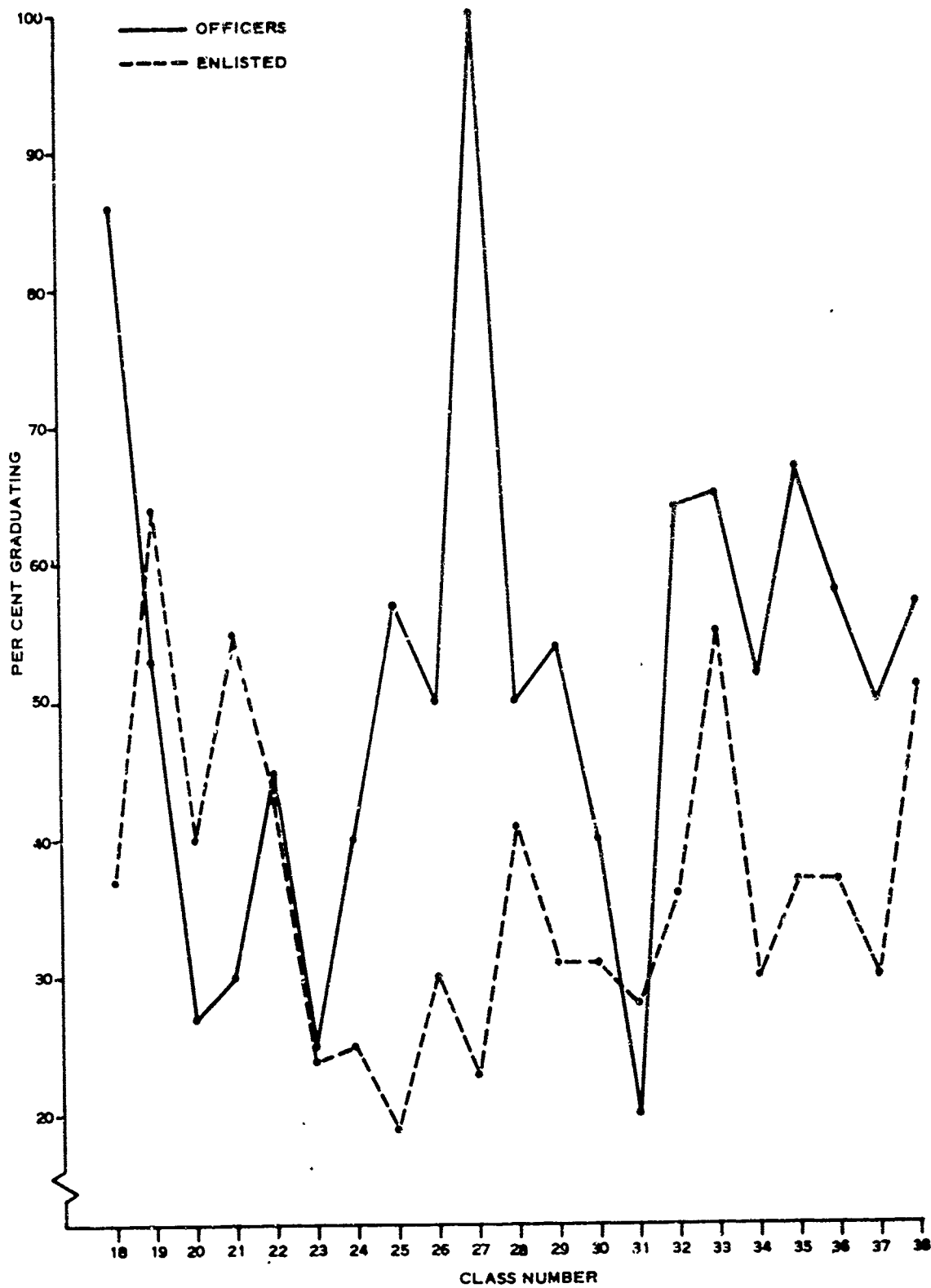


Fig. 5. Percentage of UDT graduates by class number.

TABLE 4

Number of Enlisted Men Starting UDT Training and
Percentage Graduating by Predictor Category

Source	A G E G R O U P S		Total
	Favorable (19-24, 29 or older)	Unfavorable (17-18, 25-28)	
FAVORABLE			
Boot Camp, Air, or Shore (U.S.)	47.2 (212) ^a	29.8 (84)	42.2 (296)
UNFAVORABLE			
Fleet (U.S.), Shore (Overseas)	31.3 (297)	22.6 (62)	29.8 (359)
TOTAL	37.9 (509)	26.7 (146)	35.4 (655)

Note.--

^a

Parentheses contain the numbers starting training.

TABLE 5

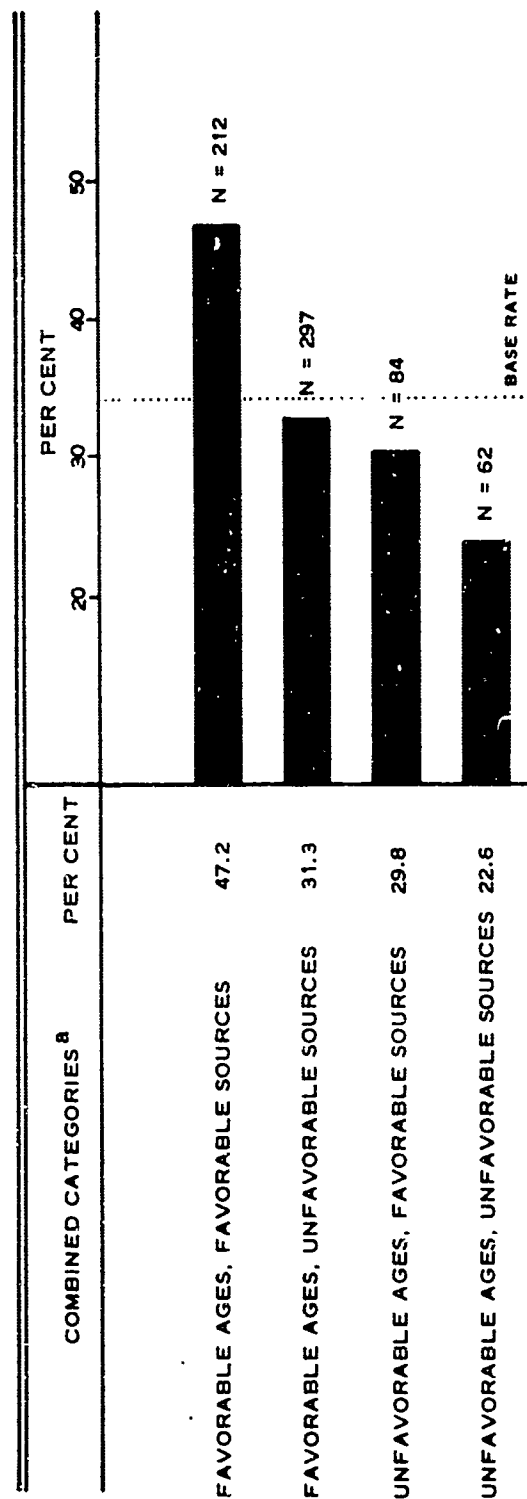
Number of Officers Starting UDT Training and Percentage
Graduating by Predictor Category

Source	A G E G R O U P S		Total
	Favorable (25-26)	Unfavorable (21-24, 27+)	
FAVORABLE (OCS)	61.5 (39) ^a	66.7 (3)	61.9 (42)
UNFAVORABLE Air, Fleet (U.S.) Shore (U.S.)	54.9 (82)	26.3 (19)	49.5 (101)
TOTAL	57.0 (121)	31.8 (22)	53.1 (143)

Note.--

^a

Parentheses contain the numbers starting training.



NOTES:

^aPREDICTOR CATEGORIES ARE DEFINED AS FOLLOWS:

FAVORABLE AGE = 19-24, 29 AND OLDER
 UNFAVORABLE AGE = 17-18, 25-28
 FAVORABLE SOURCE = BOOT CAMP, AIR, SHORE (U.S.)
 UNFAVORABLE SOURCE = FLEET (U.S.), SHORE (OVERSEAS)

Fig. 6. Percentage graduating and number starting by predictor category for enlisted men.

officer sample was classified into similar predictor categories as shown in Table 5 too few cases were available to provide a basis for further analysis.

(2) Discussion: For the enlisted men combining the better sources with the more successful age categories results in a graduation rate of 47.2 percent. This compares favorably with a 42.2 percent graduation rate when source is considered alone or 37.9 percent when age is considered alone. A similar improvement in prediction occurs when the two predictors are combined to identify the less successful students.

b. Given the information available at this time, is there an optimal strategy for selecting UDT trainees from the enlisted ranks?

(1) Yes.

(2) Discussion: The ideal enlisted population from which to select UDT trainees would include only those men of ages 19 through 24 or older than 29 from Boot Camp or Air and Shore (U.S.) billets, as can be seen in Figure 6. However, in the practical situation with various commands and activities vying for available manpower, compromises on the ideal situation must be made. Within these limitations the recommended strategy would be to select trainees from the predictor categories in the descending order shown in Figure 6. Selected in this way the first group would have the highest probability of graduation, the second group the next highest, and so on.

D. SUMMARY

To determine if differences in graduation rate exist among Underwater Demolition Team (UDT) school trainees who were categorized (1) as to source of UDT school input and (2) on the basis of other variables, information was collected on all students in UDT Classes #26 through #38.

For the enlisted sample two variables were found to be related to UDT school success to a statistically significant degree: 1) source, and 2) age. Those from Shore (U.S.) or Air billets or directly from Boot Camp have a higher graduation rate than those from Fleet (U.S.) or Overseas Shore billets. The enlisted men between the ages of 19 and 24 or who are 29 or older have a higher graduation rate than other age groups.

The following variables were either of uncertain relevance or unrelated to UDT school graduation rate: 1) input source of officers, 2) age of officers, 3) percent of officers in the starting class, 4) class size, and 5) time trend of convening classes.

Analysis showed that for enlisted men, combining age and source results in prediction better than that possible with either used alone. Still better predictive efficiency may be obtained when psychological test variables are combined with the age and Navy source variables. This will be covered in a future report.

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To determine if differences in graduation rate exist among Underwater Demolition Team (UDT) school trainees categorized (1) as to source of UDT school input and (2) on the basis of other variables, information was collected on all students in UDT Classes #28 through #38. For the enlisted sample, two variables were found to be related to UDT school success to a statistically significant degree: 1) source, and 2) age. Enlisted men from Shore or Air billets or directly from Boot Camp have a higher graduation rate than those from Fleet or Overseas Shore billets. Enlisted men between the age of 19 and 24 or who are 29 or older have a higher graduation rate than other age groups. The following variables were either of uncertain relevance or unrelated to UDT school graduation rate: 1) input source of officers, 2) age of officers, 3) percentage of officers in the starting class, 4) class size, and 5) time trend of convening classes. Analysis showed that for enlisted men, combining age and source results in prediction better than that possible with either used alone. Still better predictive efficiency may be obtained when psychological test variables are combined with the age and Navy source variables. This will be covered in a future report.		

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